APPENDIX C

SAMPLE PROCEDURE FOR THE DESIGN OF FLOOD CONTROL CHANNEL PROJECTS

I. Establish Project Objectives

- A. Flood damage reduction--level of protection desired
- B. Environmental
  - 1. Water quality
  - 2. Recreation
  - 3. Fish and wildlife
  - 4. Historic preservation
  - 5. Aesthetics

II. Identify Alternatives for Achieving Project Objectives

- A. Nonstructural
- B. Structural
  - 1. Reservoirs
  - 2. Levees
  - 3. Flood control channels

III. Evaluate Alternatives and Select General Plan

IV. Detailed Project Design for Flood Control Channels

- A. Data collection and analysis, existing conditions
  - 1. Watershed conditions
    - a) Climate
    - b) Topography
    - c) Soils/geology
    - d) Sediment yield

e) Land use/cover (existing and recent changes)

f) Hydrology

2. Stream and floodplain (each reach)

a) Hydrology

i. Generate flood frequency series

ii. Determine corresponding stage data

iii. Calculate flow duration curves (hydrographs)

b) Hydraulics

i. Identify resistance components and determine existing n values at various discharges

ii. Determine amount and size distribution of bed load and suspended load

c) Geomorphology

i. Survey cross section and existing channel grade

ii. Establish relationship of cross-section geometry to discharge

iii. Measure pool-riffle spacing and meander geometry and relate to discharge and channel width

iv. Evaluate stability of bed and banks

v. Measure size distribution of bed and bank material

vi. Measure cohesiveness of banks

vii. Identify and map locations of "hard points" in bed or bank

d) Stratigraphy (from test borings, exposed sections)

i. Determine stratigraphic sequence

ii. Describe stratigraphic units in detail

iii. Establish average depth to seasonal water tables

e) Existing structures

i. Types

ii. Locations

iii. Design

iv. Scour and deposition patterns

f) Ice

i. Recorded thickness

ii. Average dates of freeze and breakup

iii. Damage

iv. Flow patterns and blockages

g) Ecology

i. Map riparian vegetation and locate and identify unique or valuable trees

ii. Evaluate terrestrial ecology

iii. Evaluate aquatic ecology

h) Water quality

i. Physical

ii. Chemical

iii. Biological

i) Aesthetic resources - identify, describe, and photograph major components

j) Historical and recreational resources - identify and describe major resources, with particular attention to historical and archeological components

B. Flood control channel design

1. Fix exact location and alignment geometry of channels

2. Hydraulic design

a. Rapid-flow channels - use lined channels; choice of environmental features severely limited

b. Tranquil flow channels

i. Select best combination of channel cross-section alignments and construction techniques to meet flood

control and environmental objectives (see paragraph 4-1c)

ii. Select additional features to meet environmental objectives (see Tables 4-1, 4-2, and 4-3)

iii. Establish downstream water-surface elevation and the water-surface control line, including freeboard

iv. Select n values for each reach

v. Size channel

vi. Check channel stability for anticipated flows (if unstable, stabilize by one or more of the following: adjust cross section; adjust grade, line, or armor channel; provide grade control; provide bank protection)

3. Review design for maintenance considerations; adjust design if necessary

4. Review design for aesthetics; adjust if needed

C. Design environmental features of project that are not part of the flood channel proper

D. Develop detailed cost estimates; if cost too high, modify project design beginning at step IVB